**US Army Corps
of Engineers**
Hydrologic Engineering Center

HEC Software Year 2000 Compliance

May 1998

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APPENDICES

Foreword

The Year 2000 Compliance testing was implemented on the existing family of software developed at Hydrologic Engineering Center (HEC). The purpose of this project report is to document the Year 2000 compliance testing and specify actions required to achieve compliant status. The report was prepared by Messrs. James Doan, Hydraulic Engineer and Arlen Feldman, Chief of Research Division.

HEC Software Year 2000 Compliance

1.   Introduction

The Hydrologic Engineering Center (HEC) has tested its programs for Year 2000 compliance. The results of the Year 2000 testing are posted on our web site (http://www.hec.usace.army.mil/). The Year 2000 testing was conducted on the 78 programs in the HEC Computer Program Catalog (August 1997). This report identifies programs that are compliant and the programs that are non-compliant. Programs which are Year 2000 compliant do not contain analytical and date processing errors, and present graphical and tabular output correctly in four digits. However, a few programs still have a two-digit year for the execution time-identification stamp in the output printout; this is not considered as a factor for non-Year 2000 compliance. The types of behavior that we consider non-Year 2000 compliant are:

- Computational errors in processing dates and times
- Incompatible date exchange formats between programs
- Misleading date displays in output reports and plots

Most HEC programs already have built-in features for handling four-digit years. First, the option to input the year as four digits exists in most programs, although in the past most users input the year as two digits. Second, a century field may have been included. For example, if a century field is left blank, the century by default will be 1900. Otherwise, the users can specify the century as 1800, 2000, or 2100 as appropriate. Third, many programs use a standard HEC Utilities Library, HEC-LIB, to process date information. HEC-LIB can properly handle four-digit years, Julian dates, and leap years like the year 2000. If a two-digit year is supplied, an updated

HEC-LIB (version October 1997) uses a time window of 90 years backward and 10 years forward (referenced to the current computer clock time) to convert the two-digit year to four-digits. Earlier versions HEC-LIB (dated prior to October 1997) do not have this date-conversion capability.

2. Testing Methodology

The methodology for the Year 2000 compliance testing started by separating HEC programs into two groups. The first group contained inactive or discontinued programs, supporting utilities, and programs that were no longer supported by HEC. For example, programs like HEC-4 and HYCOST were considered as inactive and were classified under the Support Level 3 according to the Computer Program Catalog. Programs under Support Level 3 fit "into one or more of the following categories: (1) very specialized application areas, (2) seldom used, (3) marginally supported, (4) inadequately documented, (5) superseded or preliminary versions of HEC or contractor programs. Source code enhancement/correction is generally not performed. Distribution of Level 3 programs is not encouraged." Year 2000 modifications to these programs will be on a case-by-case basis.

The second group contained active programs. For each active program, a standard test was conducted to learn about how the program treated and processed dates, see Appendix A. First, the test acquired background information on the program name, version number, and/or version date. Then, the test identified the location and format of dates in the program, library subroutines, and other related programs. Next, the test evaluated the calculation capabilities and the date displays under several cases generated by combining the computer clock settings at the current time and at 01Jan2000 with sample data files containing input time windows from 1899 to 1901, 1999 to 2001, and 2099 to 2101. If a program was not compliant, the test also specified corrective steps and estimated the effort required for Year 2000 compliance.

3. Results

The Year 2000 Test results are presented in Appendix B using the same Technical Area organization as in our Computer Program Catalog. In general, HEC programs do not have date-related computational errors, data storage, data exchange, or tabular and graphical display problems. In Appendix B, programs are assigned one of five action codes as follows.

Action Code	Description
a	The program has passed our Year 2000 testing and no action is required by the user.
b	The currently distributed program version has not passed our year 2000 testing but a compliant version of the program can be downloaded from HEC's web site.
c	The program is currently being repaired for Year 2000 compliance.
d	Inactive programs for which Year 2000 testing has been waived.
e	Programs still undergoing Year 2000 testing.
f	Program is under development. Current test version is Year 2000 compliant. Contact HEC for current developmental version.

The DSPLAY and DWINDO programs have been modified for Year 2000 compliance and should be replaced. In graphical displays created with DSPLAY (version 2.0.1 dated March 1995) using annual time-scales, the years are shown as 2-digits, which has the potential for misinterpretation. Users are encouraged to obtain a new version of the DSPLAY program, which shows the year as 4-digits, or they can manually edit the years to 4-digits on the graph with a graphics editor. The new DSPLAY program (UNIX version February 1998 and personal computer version 2.0.11 dated March 1995) is available for download through our web site. In addition, we have re-linked other programs in the HEC-DSS package with the updated HEC-LIB (version October 1997) and made them available for download.

The programs not currently compliant are HEC-1F, MODCON, PRECIP and HEC-5Q. Programs HEC-1F, MODCON, and PRECIP will be replaced shortly by new Water Control Data System software which will be Year 2000 compliant. Program HEC-5Q will be replaced under a separate work item.

Most programs under the Water Quality section are not widely used and therefore have not been tested yet.

Appendix A

Year 2000 Compliance Standard Test Form

Year 2000 Compliance Standard Test Form

QUESTION	RESPONSE	COMMENT
1. Program name and version or date.		
2. Does the program have an input date? (if no, skip the test)		
3. How does the program treat the date? (format, location, etc.)		
4. Does the program use libraries subroutines to process date? (if yes, list the subroutines)		
5. Does the program perform calculations with the input date? (provide examples)		
6. Evaluate date display and calculation capabilities for the following cases. **Case 1:** Confirm that computer clock setting is at current time. Start the test with input date from 1899 to 1901 and 1999 to 2001. **Case 2:** Set computer clock setting to 01Jan2000 at 12 pm. Start the test with input date from 1899 to 1901, 1999 to 2001, and 2099 to 2101.		
7. Present input file and output results with tables and plots, as appropriate.		
8. Document program behaviors.		
9. Is the program in Year 2000 compliant?	Yes or No Tested by_____ (Circle) Date_____	
10. Effort required for Year 2000 compliant?		

Appendix B

Hydrologic Engineering Center Programs
Year 2000 Compliance Testing Results

Hydrologic Engineering Center Programs Year 2000 Compliance Testing Results

Program Name by Technical Area	Currently Distributed		Program Tested		Year 2000 Compliant	Action Code	Comment
	Version	Date	Version	Date			
DATA STORAGE SYSTEM (HEC-DSS)							
HEC-DSS Package							
DSPLAY, Display DSS	2.0.1	Mar 1995	2.0.11	Feb 1998	Yes	b	Download
DSSITS, Enter Irregular Time Series in DSS	3.6	Mar 1995	3.6	Oct 1997	Yes	b	Download
DSSPD, Enter Paired Data in DSS	3.4.4	Mar 1995	3.4.4	Oct 1997	Yes	b	Download
DSSTS, Enter Time Series in DSS	2.8	Mar 1995	2.8	Oct 1997	Yes	b	Download
DSSTXT, DSS Text Data Entry Program	1.2.2	Mar 1995	1.2.2	Oct 1997	Yes	b	Download
DSSUTL, DSS Utility Program	6.8	Mar 1995	6.8	Oct 1997	Yes	b	Download
DSSMATH, Mathematical Utilities for DSS Data	2.0.5	Mar 1995	2.0.6	Apr 1998	Yes	b	Download
DSSSHF, Output DSS Data in SHEF Format	2.2	Mar 1995	2.2	Oct 1997	Yes	b	Download
SHFDSS, Load SHEF Data in DSS	2.6.1	Mar 1995	2.6.1	Apr 1998	Yes	b	Download
NWSDSS, Load NWS Data Tapes in DSS	5.3	Mar 1995	5.3	Oct 1997	Yes	b	Download
WATDSS, Load WATSTORE Data in DSS	2.4.1	Mar 1995	2.4.1	Oct 1997	Yes	b	Download
DWINDO, Interactive Data Entry and Editing	2.1	Mar 1995	2.1	Apr 1998	Yes	b	Download
REPGEN, Report Generator	3.2.2	Mar 1995	3.2.4	Nov 1997	Yes	b	Download
PLANNING ANALYSIS							
HEC-FDA Package, Flood Damage Analysis	1.0	Feb 1998	1.0	Feb 1998	Yes	a	
DAMCAL, Damage Reach Stage-Damage Calculation	none	Apr 1994	2.1	Apr 1994	Yes	a	
EAD, Expected Annual Flood Damage Computation	none	Apr 1994	2.1	Apr 1994	Yes	a	

Program Name by Technical Area	Currently Distributed		Program Tested		Year 2000 Compliant	Action Code	Comment
	Version	Date	Version	Date			
SID, Structure Inventory for Damage Analysis	none	Apr 1994	2.1	Apr 1994	Yes	a	
SIDEDT, Structure Inventory for Damage Analysis Edit	none	Apr 1994	2.1	Apr 1994	Yes	a	
AGDAM, Agricultural Flood Damage Analysis	none	Oct 1989	none	Oct 1989	Yes	a	
HEC-PBA, Project Benefit Accomplishment Package	none	Aug 1995	1.3	Aug 1995	Yes	a	
HYCOST, Small-Scale Hydroelectric Power Cost Estimates	1.1	Jul 1983			N/A	d	Inactive
RESERVOIRS							
HEC-5, Simulation of Flood Control and Conservation Systems	7.2	Mar 1991	Beta 8.0	Jan 1998	Yes	b	Available in Jun 1998
CKHEC5, Input Data Checking Program for HEC-5	none	Mar 1991	none	Mar 1991	Yes	a	
INCARD, Flow Conversion for HEC-5	none	Mar 1991			N/A	d	Inactive
INFIVE, Interactive Input Preparation Program for HEC-5	none	Mar 1991	none	Mar 1991	Yes	a	
MOD5, Interactive Input Modification Program for HEC-5	none	Mar 1991	none	Oct 1997	Yes	b	Available in Jun 1998
GATEREG, Spillway Gate Regulation Curve	none	Apr 1992	none	Apr 1992	Yes	a	
HEC-PRM, Prescriptive Reservoir Model	none	Apr 1994	none	Apr 1994	Yes	a	
HYDUR, Hydropower Analysis Using Streamflow Duration Procedures	none	Nov 1986			N/A	d	Inactive

Program Name by Technical Area	Currently Distributed		Program Tested		Year 2000 Compliant	Action Code	Comment
	Version	Date	Version	Date			
RESACT, Reservoir Area-Capacity Table by Conic Method	none	Jun 1990	none	Jun 1990	Yes	a	
RESYLD, Reservoir Yield	none	Aug 1966	none	Aug 1966	Yes	a	
RIVER HYDRAULICS							
HEC-2, Water Surface Profiles	4.6	May 1991	4.6.2	May 1991	Yes	a	
EDIT2, HEC-2 Data Checker	none	May 1991	4.6	May 1991	Yes	a	
PLOT2, HEC-2 Graphics	none	May 1991	4.6	May 1991	Yes	a	
SUMPO, Interactive Summary Printout Using HEC-2	none	May 1991	4.6	May 1991	Yes	a	
HEC-6, Scour and Deposition in Rivers and Reservoirs	4.1	Oct 1993	4.1	Oct 1993	Yes	a	
HEC-RAS, River Analysis System	2.1	Oct 1997	2.1	Oct 1997	Yes	a	
PAS, Preliminary Analysis System for Water Surface Profile Computations	none	Jul 1988	none	Mar 1988	Yes	a	
UNET, One-Dimensional Unsteady Flow through a Full Network of Open Channels	3.2.0	Aug 1997	3.2.0	Aug 1997	Yes	a	
STATISTICAL HYDROLOGY							
HEC-FFA, Flood Frequency Analysis	3.1	Feb 1995	3.1	Feb 1995	Yes	a	
HEC-4, Monthly Streamflow Simulation	none	Jul 1986			N/A	d	Inactive
MLRP, Multiple Linear Regression Program	none	Jul 1986			N/A	d	Inactive
REGFRQ, Regional Frequency Computation	none	Jan 1987			N/A	d	Inactive
STATS, Statistical Analysis of Time-Series Data	none	Fall 1995	Beta	Dec 1996	Yes	f	

Program Name by Technical Area	Currently Distributed		Program Tested		Year 2000 Compliant	Action Code	Comment
	Version	Date	Version	Date			
SURFACE WATER HYDROLOGY							
HEC-HMS, Hydrologic Modeling System	1.0	Mar 1998	1.0	Mar 1998	Yes	a	
HEC-1, Flood Hydrograph Package	4.0	Sep 1990	4.0	Sep 1990	Yes	a	
HEC-IFH, Interior Flood Hydrology Package	1.04	Oct 1992	1.04	Oct 1992	Yes	a	
HMR52, Probable Maximum Storm (Eastern U.S.)	none	Apr 1991	none	Apr 1991	Yes	a	
HYDPAR, Hydrologic Parameters	none	Oct 1985			N/A	d	Inactive
UHCOMP, Interactive Unit Hydrograph and Hydrograph Computation	none	Jul 1986			N/A	d	Inactive
UTILITIES							
COED, Corps Editor	none	Nov 1987	none	Nov 1987	Yes	a	
HEC-LIB, HEC Subroutine Library	none	Mar 1995	none	Oct 1997	Yes	a	
WATER CONTROL							
ASYNC, Asynchronous Communication Real Time	4.1	Sep 1993	4.1	Sep 1993	Yes	a	
ASYNCI, Interactive Asynchronous Communication	3.2	Sep 1993	3.2	Sep 1993	Yes	a	
DATAST, Data Status	2.1	Jun 1991	2.1.1	Jun 1991	Yes	a	
DATCHK and DATVUE, Data Screening Software	1.1	Feb 1995	1.1.3 and 1.0.4	Feb 1995	Yes	a	
EXTRCT, Extract Data From DSS File	2.1	Mar 1995	2.1.2	Mar 1995	Yes	a	
GOEDEC, Convert GOES Data to SHEF	none	Dec 1993	1.04	Dec 1993	Yes	a	
HEC-1F, Modified HEC-1 for Real-Time Water Control Systems	1.3.23	Mar 1992	1.3.23	Mar 1992	No	c	Available in Sep 1998

Program Name by Technical Area	Currently Distributed		Program Tested		Year 2000 Compliant	Action Code	Comment
	Version	Date	Version	Date			
MODCON, Interactive Executive for Model Control	none	Jan 1994	2.2.2	Jan 1994	No	c	Available in Sep 1998
MONNWS, Monitor NWS Dedicated Line	5.5	Mar 1995	4.7.5	May 1995	Yes	a	
PRECIP, Basin Precipitation Computations	1.8	Mar 1993	1.8.1	Mar 1993	No	c	Available in Sep 1998
PREFOR, Pre-Forecast Data Preparation	none	May 1991	1.7.0	May 1991	Yes	a	
PREOP, Pre-Operations Data Preparation	none	Apr 1990	none	Apr 1990	Yes	a	
REPLST, Report Lister	none	Mar 1990	none	Mar 1990	Yes	a	
REPUTL, Report Utility Processor	none	Mar 1990	none	Mar 1990	Yes	a	
VUENWS, View NWS Products	4.7	May 1995	4.7.5	May 1995	Yes	a	
WATER QUALITY							
HEC-5Q, Simulation of Flood Control and Conservation Systems (Including Water Quality Analysis)	7.2	Mar/Aug 1991	7.2	Mar/Aug 1991	No	c	Available in Sep 1998
GEDA, Geometric Elements from Cross Section Coordinates	none	Dec 1987			Unknown	e	Not tested
HEATX, Heat Exchange Program	none	May 1987			Unknown	e	Not tested
WEATHER	none	Jan 1990			Unknown	e	Not tested
RESTMP, Reservoir Temperature Stratification	none	Jul 1984			Unknown	e	Not tested
THERMS, Thermal Simulation of Lakes	none	Feb 1977			Unknown	e	Not tested
WQRRS, Water Quality for River-Reservoir Systems	none	Jan 1989			Unknown	e	Not tested
WQRRSR, Reservoir Water Quality	none	N/A			Unknown	e	Not tested

Program Name by Technical Area	Currently Distributed		Program Tested		Year 2000 Compliant	Action Code	Comment
	Version	Date	Version	Date			
WQRRSQ, Stream Water Quality	none	N/A			Unknown	e	Not tested
SHP, Stream Hydraulics Package	none	Jan 1992			Unknown	e	Not tested
WQSTAT, Water Quality Statistics	none	Mar 1981			Unknown	e	Not tested

Action Code a - Passed Year 2000 testing, no action necessary
  b - Compliant version can be downloaded from HEC's web site
  c - Program is being repaired for Year 2000 compliance
  d - Inactive program with Year 2000 testing waived
  e - Undergoing Year 2000 testing
  f - Program still under development. Current test version is Year 2000 compliant. Contact HEC for current developmental version.